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ELICITED IMITATION AS A RESEARCH TOOL IN DEVELOPMENTAL PSYCHOLINGUISTICS.

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THE AUTHORS HAVE CONCERNED THEMSELVES IN THIS STUDY WITH IMITATION AS A DEVICE BY WHICH THE INVESTIGATOR CAN LEARN ABOUT CHILD LANGUAGE. THE DATA EXAMINED ARE PART OF A LONGITUDINAL THREE-MONTH STUDY OF LINGUISTIC DEVELOPMENT IN A TWO-YEAR-OLD CHILD. THE REPORT IS BASED ON 1,000 ELICITED IMITATIONS. CERTAIN PHENOMONA WERE OBSERVED GENERALLY WHEN THE MODEL SENTENCES WERE SOMEWHAT BEYOND THE CHILD'S NORMAL SENTENCE PROCESSING SPAN AND WERE NOT ANOMALOUS. THESE SEEMED TO DEMONSTRATE THAT SENTENCE RECOGNITION AND IMITATION ARE FILTERED THROUGH THE INDIVIDUAL'S PRODUCTIVE LINGUISTIC SYSTEM. WHILE THE CHILD COULD UTTER SENTENCES SPONTANEOUSLY WHICH SHE COULD NOT IMITATE, SHE COULD ALSO GIVE "RECODED" IMITATIONS OF MODEL SENTENCES WHICH EXCEEDED HER PRODUCTIVE CAPACITIES. SOME INTERESTING SIDE-PHENOMONA WERE OBSERVED--(1) OMITTED ITEMS, SUCH AS ARTICLES, COPULA, EMBEDDED CLAUSES, MAY SIMPLY NOT HAVE BEEN HEARD, (2) HESITATION PAUSES WERE IMPORTANT CUES, (3) PRESERVATION OF STRESS SEEMED TO BE GENERAL THOUGH ITS POSITION WAS NOT ALWAYS PREDICTABLE, AND (4) THE PRESERVATION OF RHYTHMIC AND INTONATIONAL ASPECTS IN IMITATION MAY BE BASIC. AN IMPORTANT EXCEPTION TO THE LAST OBSERVATION WAS THAT THE CHILD IGNORED REPEATED WORDS UNLESS THE REPEATED WORD COULD BE INTERPRETED AS AN APPROPRIATE LEXICAL ITEM IN THE SENTENCE. THIS PRELIMINARY ANALYSIS INCLUDES A REFERENCE LIST OF STUDIES IN CHILD LANGUAGE. (AM)

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PRELIMINARY VERSION

ELICITED IMITATION AS A RESEARCH TOOL IN DEVELOPMENTAL PSYCHOLINGUISTICS

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Imitation probably is not an important device in language acquisition, because the aspects of language which the child must acquire are not available to be imitated: he is exposed only to surface structures of sentences, but what he must acquire are deep structures and the transformational rules which relate deep and surface structures. This argument has already been well developed by linguists and psycholinguists (e.g. papers in Smith and Miller, 1966), and we are not concerned in this paper with the role played by imitation in the natural situation of language acquisition. (This problem is discussed in Slobin, 1967.) Our present task is to determine what can be learned through the use of controlled, elicited imitations as a probe to discover the child's underlying linguistic competence. That is to say, we are concerned here with imitation as a device by which the investigator can learn about the child's language, and not as a device by which the child can learn about the adults' language.

Many of the ideas suggested in this paper grew out of discussion with Mr. Barry A. Gordon, and many of the data were gathered and transcribed with the assistance of Miss Susan Carter. To both we extend our thanks.

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The data examined here are part of a longitudinal study of linguistic development in one child. In keeping with the tradition of pseudonyms established by Brown and Bellugi's "Adam," "Eve," and "Sarah" (1964) and McNeill's "Izanami" (1966), we will refer to our subject as "Echo." She is a precocious, first child of graduate student parents, and has no siblings. This report is based on 1000 elicited imitations, collected between the ages of 2;3;2 and 2;5;3. (Ages are given in years, months, and weeks.) By elicited imitations we refer to the child's repetition of a model sentence presented in a context calling for imitation, as opposed to the child's spontaneous imitation of adult utterances.* The time segment examined here is part of a continuing study of Echo's linguistic and cognitive development, going back to infancy, and projected into the indefinite future.

Psycholinguistic literature presents the following general picture of sentence imitation by two-year-olds (e.g. Brown and Fraser, 1963): The child repeats stressed content words in proper order, with length and complexity of utterance not exceeding that of his spontaneous speech. That is, imitations have the same "telegraphic" character as the child's own utterances, in which many function words and inflections are missing. Our intensive study of elicited imitations shows that all of these general statements are in need of modification. In addition, the "classical" picture gives no explanation of why imitation should be of this nature. One is simply left with the notion that the child scans a sentence and picks up some of the stressed, familiar words, working from left to right. We do not yet have a clear understanding

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* In the early stages of the investigation it was necessary to give the child explicit instructions to imitate (e.g. "Can you say..." or "Say..."). Such instruction soon became superfluous, as Echo apparently learned the subtle cues signalling a model sentence to be repeated. We are aware, however, of the problems posed by the fact that we have no way of assessing Echo's definition of the task (or even if she always interprets the task in the same way.)

of why he picks out the words he does, and the extent to which his knowledge of the language determines the way in which he recognizes, stores, and reproduces sentences in immediate repetition. We are beginning to understand aspects of this process a bit more clearly, and are in the process of building a model for sentence imitation--a model which will, we hope, also eventually reveal something about the way in which sentence recognition and comprehension takes place normally, in both children and adults.

The general picture presented in the literature seems to hold true only if the model sentence is somewhat beyond the child's normal sentence processing span and is not anomalous. The following example corresponds well with this picture. (The model sentence, uttered by an adult, is given in capital letters; the child's imitation is given immediately below, in lower-case letters, followed by age in years, months, and weeks.)

(1) THE PENCIL IS GREEN
pencil green (2;3;2)

Note that the child drops the article and copula, as expected (though the article sometimes occurs in Echo's speech and imitations at this age).

However, Echo also has much longer sentences in her free speech, and at this same age can easily imitate another four-word sentence such as:

(2) TIGERS CAN DRINK MILK
tiger can drink milk (2;3;3)

And she can even successfully imitate much longer sentences (although often omitting article and copula), such as:

(3) THE LITTLE BOY IS EATING SOME PINK ICE CREAM
little boy eating some pink ice cream (2;3;2)

Number of words, or number of morphemes, is clearly not a relevant measure of how much of a sentence a child can imitate. At this age, in her free speech, she has sentences as complex as, "It'll get burned in there"; and sentences as long as, "This's Echo room, but then Daddy won't come in Echo room."

On the other hand, when she is somewhat older, and her grammar quite a bit more complex, she may drop out an entire embedded clause from a sentence which is not especially long in terms of morpheme-count:

(4) MOZART WHO CRIED CAME TO MY PARTY
Mozart came to my party (2;4;3)

(Mozart is a teddy-bear.)

On the way towards discovering some of the determinants of Echo's imitations we came across several interesting side-phenomena which deserve passing mention.

If items are omitted from imitation, it may be that they are simply not heard. It has been frequently noted that the words omitted by the child are those most difficult for a transcriber to pick up from tape recordings of adult speech. Perhaps, then, one can simply get a child to imitate a normally omitted item by saying it especially loudly and clearly. And, in fact, one can sometimes get Echo to imitate an omitted element simply by stressing it, as in (5). (Underlining indicates stress; "..." indicates pause.)

(5) THE PENCIL IS GREEN
pencil...<u>is</u> green (2;3;2)

(Note that hesitation pauses are important cues to sentence processing.)

Stress in the model sentence can also lead to alteration, as well as insertion of new material:

(6) WE WERE HIDING
we was hiding (2;3;2)

WE WERE HIDING
we was hiding

WE <u>WERE</u> HIDING
we <u>were</u> hiding

It is interesting that properly positioned stress is maintained in the imitations presented in (5) and (6). However, one cannot simply state as a rule that any stressed item will be imitated, and that position of stress will

be maintained, because of examples such as:

(7) THE BOY IS EATING AND CRYING
boy eating nuh crying (2;3;3)

Note, however, that stress is preserved in (7), although shifted to another position. This preservation of stress seems to be general, though its position is not always predictable. Even if all words are preserved, stress may still be shifted:

(8) THERE ARE THE RED BEADS
there are the red beads (2;3;3)

The preservation of rhythmic and intonational aspects in imitation may be basic--and perhaps universal. (For example, Fitzgerald [1966], in a study of spontaneous imitations by two-year-old speakers of Gã--a tone language--found errors in segmental phonology to occur far more frequently than distortion of the tonal and rhythmic structures of the sentences imitated. In fact, 28% of segmental phonemes were incorrectly imitated, while only 2% of tonal phonemes were incorrectly imitated.)

We discovered, however, an important and intriguing exception to the generalization that rhythmic and intonational aspects of sentences tend to be retained in imitation. Echo consistently ignores repeated words in model sentences (9-11), unless the repeated word can be interpreted as an appropriate lexical item in the sentence (12).

(9) MARK FELL FELL OFF THE HORSE
Mark fell off a horse (2;3;2)

(10) I CAN CAN CAN EAT
I can eat (2;3;2)

(11) I NEED NEED THE BALL
I need the ball (2;3;2)

(12) I NEED THE BALL BALL
I need the ball ball (2;3;2)

This was true at 2;3;2, and also when repeated a month later, at 2;4;3. Echo ignored doubling or tripling of words, even if they were nonsense words:

(13) KITTY WAS PERKING PERKING PERKING THE ICE CREAM
kitty was perking the ice cream (2;4;3)

A moment's consideration convinces one of the adaptive necessity of such a strategy in sentence recognition. A child could simply not arrive at a reasonable grammar of a language if he tried to account for stutterings and false starts in the speech of his parents. To ignore successively repeated words in a sentence may be a basic instruction in the child's language acquisition device.

Examples (10) and (11) show that even if repeated words are all stressed, they are not picked up as repeated. Word repetition can, however, be recoded as stress in repetition:

(14) WHERE WHERE IS KITTY?
<u>where</u> kitty? (2;3;2)

(15) MOZART FELL OFF OFF THE TABLE
Mozart fell <u>off</u> the table (2;3;2)

It may be significant that the only function of word reiteration in English--namely adverbial emphasis (e.g. "very, very good")--can also be realized by stress (e.g. "<u>very</u> good"). These two devices seem to bear a certain equivalence both in the adult system and in Echo's imitations.

Before proceeding to more central findings, allow us to briefly note one more suggestive phenomenon which we have turned up in our investigations. Often Echo will spontaneously produce a fairly long and complex utterance, and, if this utterance is offered as a model immediately after its production, it will be (more or less) successfully imitated. However, if the very same utterance is presented to the child ten minutes later--i.e., the child's <u>own</u> utterance--she will often fail to imitate it fully or correctly. For example:

(16) IF YOU FINISH YOUR EGGS ALL UP, DADDY, YOU CAN HAVE YOUR COFFEE
after you finish your eggs all up then you can have your coffee, daddy
(2;5;1)

ten minutes later:

you can have coffee, daddy, after

half-hour later:

YOU CAN HAVE COFFEE, DADDY, AFTER YOU EAT YOUR EGGS ALL UP
after you eat your eggs all up...eat your eggs all up

(The model sentences were offered by Echo's father. The sentence was still true on second presentation.) It would seem that the child has an "intention to-say-so-and-so"--to use William James' phrase--and has encoded that intention into linguistic form. If that linguistic form is presented for imitation while the intention is still operative, it can be fairly successfully imitated. Once the intention is gone, however, the utterance must be processed in linguistic terms alone--without its original intentional and contextual support. In the absence of such support, the task can strain the child's abilities, and reveal a more limited competence than may actually be present in spontaneous speech. Thus whatever we discover in systematic probes of imitation must be taken as a conservative estimate of the child's linguistic competence.

These phenomena begin to point to a process which has ocassionally been suggested in the literature--namely, that, in repeating a sentence, one must filter it through one's own productive system. To use Piaget's terminology, a sentence, when recognized, is assimilated to an internal schema, and, when reproduced, is constructed in terms of that schema. The question of interest, of course, is the extent to which such schemata correspond to the structures and principles of linguistic theory. We believe that our findings can begin to cast some light on that question.

Perhaps the most obvious examples of this sort of "assimilatory deformation," or "recoding in short-term memory," are cases in which one word is substituted for another, preserving meaning. This was the case in (6). Additional examples are:

(17) TOMORROW THERE WILL NOT BE A LONG LINE
won't be a long line (2;4;3)

(18) THIS ONE IS THE GIANT, BUT THIS ONE IS LITTLE
dis one little, annat one big (2;4;3)

This sort of rephrasing seems to be clear evidence that the child has retrieved the underlying meaning of the sentence, and is encoding that meaning in a new form in imitation. This is a very basic point, and one that re-appears again and again in various forms.

Example (18) shows another very interesting finding, in addition to the recodings of "giant" to "big," and "but" to "and." Note that the two propositions are inverted (with a change in conjunction). This is a very frequent finding in our data--and one that contradicts the generalization that order of elements is always preserved in imitation. If a sentence is a conjunction of two underlying propositions, and the child understands both propositions, she will very frequently give the second proposition first in her imitation. We find many examples of this sort of inversion of sentences--conjoined by "and"--a month earlier (19, 20), and more recently as well (21).

(19) THE RED BEADS ARE HERE AND THE BROWN BEADS ARE HERE
brown beads are over here; red beads over there (2;3;3)

(20) THE RED BEADS AND BROWN BEADS ARE HERE
brown beads here an' a red beads here (2;3;3)

(21) MOMMY ATE THE CANDY AND MOMMY ATE THE ICE CREAM
mommy eat the ice cream and mommy eat a candy (2;5;3)

Note that Echo does not always give a literal repetition in these imitations, but that she has clearly retained the two propositions. In (19) she even gives them as separate sentences, not conjoined by "and."

The inversion of conjoined sentences clearly indicates that Echo comprehends the use of "and" as a sentence conjunction. In fact, she will sometimes introduce it herself:

(22) THE CANDY IS MARPLE. THE SHOE IS MARPLE.
...shoe marple an' a candy marple (2;3;3)

Not only does she comprehend the conjunction, but she must comprehend the structures of the two conjoined sentences as well. This is indicated in (22) (and elsewhere) by inverted imitation of conjoined sentences with nonsense words occupying certain slots. Even though she has omitted the copula in her imitation, she must have correctly analyzed its function in order to have repeated the model sentences as she did. (A nonsense word in copular position will be imitated.)

Inversion of conjoined sentences also reveals something of Echo's strategy in sentence imitation. The data suggest that she has retained the general syntactic form of the model sentence--in this case, two sentences conjoined by "and"--and what she is concerned with in output is to produce something of this general syntactic form. The exact content words and details of structure, however, are often lost, frequently resulting in the imposition of parallel constructions, as in the imposition of "here" in the second part of (20).

This attempt to reproduce two parallel constructions can often take precedence over semantic content, as in:

(23) THE BLUE SHOES AND BLUE PENCILS ARE HERE
blue pencil are here and a blue pencil are here (2;3;3)

It looks as if Echo has filled up so much of her short-term memory with information about the syntactic structure of the model sentences that she has no more room for all of the lexical items. She clearly knows, however, what sorts of items are needed. And so, when she comes to the second nounphrase, she fills it appropriately with a noun from the model sentence--"pencil"--but

in so doing uses the same noun twice. This matter of finding words to fit an abstract syntactic frame--or lexical instantiation of the structure--is a very common occurrence, even when parallel constructions are given in the model sentence. For example:

(24) SUE ATE THE CANDY AND MOMMY ATE THE ICE CREAM
mommy ate the ice cream and mommy eat the ice cream (2;5;3)

(Another example of this phenomenon appears in the second imitation of example (30), where "bread and jam" is imitated as "jam and jam.")

At the end of the paper we present preliminary data from sentence imitation by adults which suggests a similar model in adult sentence recognition: retrieval of a syntactic structure, lexical items appropriately marked as to syntactic and semantic function, and an attempt to fill in the syntactic structure with whatever of the lexical items from the model sentence are available in short-term memory.

For now, however, let us return to this matter of imposition of parallel constructions on conjoined sentences. Note that this can occur with or without inversion. The imitations in (20) and (21) are examples of the two phenomena combined: Echo repeats the second sentence, and then imposes some aspect of its structure and/or content on the first. If the two sentences are quite simple, however--as in the "X is here" type--she can sometimes impose parallel constructions without inverting:

(25) THE PENCIL AND SOME PAPER ARE HERE
some pencil here and some paper here (2;3;3)

As a matter of fact, in the case of this simple sentence type, she can also perform the inverse operation of deleting and conjoining:

(26) HERE IS A BROWN BRUSH AND HERE IS A COMB
here's a brown brush an' a comb (2;3;3)

She can even do this occasionally with conjoined subject-verb-object sentences--in the following example even pronominalizing the subject nounphrase and deleting all redundant elements from the second sentence, retaining only the object:

(27) DADDY IS GOING TO GET SOME COOKIES AND DADDY IS GOING TO GET SOME JUICE
he gonna get some cookie and juice (2;3;3)

However, if the two conjoined sentences differ in structure, Echo has great difficulty in retaining both structures, indicating clearly that each syntactic structure takes up a certain amount of space in short-term memory. This is especially clearly revealed in hesitations, false starts, and imposition of parallel constructions, as in:

(28) MOZART GOT BURNED AND THE BIG SHOE IS HERE
Mozart got burned an-duh...big shoe got burned (2;3;3)

(Echo used the form "got burned" productively in spontaneous speech at this time.) Sometimes this difficulty leads to repetition of the same sentence twice:

(29) THE BATMAN GOT BURNED AND THE BIG SHOE IS HERE
big shoe is here and a big shoe is here (2;3;3)

Note that it is not predictable which of the two sentences Echo will start off with, but that she retains the notion that there must be two sentences, even if she repeats the same sentence twice. (This should not be taken as an absolute statement, however. Occasionally--when distracted, or tired, or for other, unknown reasons--Echo will repeat only one of two conjoined sentences. It is interesting that, in such cases, it is always the second of the two sentences which is repeated--reflecting the phenomenon noted above of frequent inversion in repetition of conjoined sentences.)

The imposition of parallel constructions suggests not only that syntactic structures are stored as abstract entities in short-term memory, but that

the child may establish a set for a given syntactic structure, thus "blinding" her to other structures. This suggests an experiment such as that performed by Mehler and Carey (in press) in which subjects, after hearing ten sentences of the type "They are recurring mistakes" found it more difficult to hear an eleventh of the type "They are describing events." Although we have not yet performed such an experiment with Echo, we have one bit of suggestive evidence for a similar establishment of a set for a given syntactic structure:

(30) THE BIRD ATE THE BREAD AND JAM
bird <u>ate</u> a jam (2;5;1)

THE BIRD ATE THE <u>BREAD</u> AND JAM
bird ate the <u>jam</u> and jam

THE BIRD ATE THE BREAD AND FLEW AWAY
bird ate...ate ate <u>ate</u>

THE BIRD ATE THE JAM AND FLEW AWAY
bird ate the jam and flew away

The above examples give some hint of the rich data provided by imitations of conjoined sentences. About a month after we collected imitations of sentences such as those shown in (18-29), we noticed a very interesting phenomenon in Echo's imitations of conjoined sentences in which both sentences had the same nounphrase: she would pronominalize the second nounphrase, as in:

(31) THE PUSSY EATS BREAD AND THE PUSSY RUNS FAST
pussy eat bread and he run fast (2;4;3)

This suggests very strongly that she had mastered the transformation calling for pronominalization of repeated nounphrases in such structures, and that she was using this transformation in producing an utterance based on the underlying structure she had retrieved from the model sentence. She would even introduce a pronoun for a second nounphrase if it was deleted in the model sentence:

(32) THE OWL EATS CANDY AND RUNS FAST
owl eat candy...owl eat the candy and...he run fast (2;4;3)

Her hesitations and false starts indicate she was working hard to produce an imitation matching her image of the model. The introduction of a pronoun for the second nounphrase suggests that her rules do not yet allow for the total deletion of a repeated nounphrase in this sort of structure (although note that she was able to do so a month earlier in the simpler structure represented in example (27)).

At this age—2;4;3—she imitated sentences with embedded who-constructions in similar fashion, suggesting a comprehension which exceeded her productive competence; e.g.:

(33) MOZART WHO CRIED CAME TO MY PARTY
Mozart cried and he came to my party (2;4;3)

The parallel interpretation of conjoined sentences and of sentences with embedded who-constructions is especially clear in the following two examples, in which Echo's imitations of two different structures are virtually identical:

(34) THE OWL EATS CANDY AND THE OWL RUNS FAST
owl eat candy and he run fast (2;4;3)

(35) THE OWL WHO EATS CANDY RUNS FAST
owl eat a candy and he run fast (2;4;3)

These examples suggest that who is ignored. It could be that Echo scans her memory of the model sentence looking for subject-verb-object (SVO) constructions; and, if a subject occurs twice, or if a second subject is lacking, she will use he in that position. In addition, her rules require that she join the two SVO constructionswith and.

Further support for such an imitation device comes from numerous imitations such as the following:

(36) THE MAN WHO I SAW YESTERDAY GOT WET
I saw the man and he got wet (2;4;3)

Note that word order in the first part of the sentence is not maintained. In her free speech, Echo uses I only in subject position, and so appropriately

uses I as subject of sentences such as these. Thus it is not clear from such examples whether who-constructions of this sort are understood in adult fashion, or whether a more simple rule of seeking SVO sequences is being applied. In sentences such as (33) and (35), who could simply have been ignored, and SVO still have been appropriately retrieved. Unfortunately, our data are scanty in this regard, but we have some suggestive evidence that this who-construction is beginning to be understood, and that it enters as a more compact way of pushing together in surface structure information which must be represented by two propositions--two "S's"--in deep structure. The clearest example is the following intriguing substitution in successive imitations of the same model sentence:

(37) THE MAN WHO I SAW YESTERDAY RUNS FAST
I saw the man who run fast
I saw the man and he run fast (2;4;3)

The notion that Echo may have been looking for SVO relations in the model sentences intrigued us, and so we constructed sentences in which it would be very difficult to retrieve the underlying structure if the necessary transformation rules were lacking. These were sentences in which the rate of information transmission in surface structure was very compact, due to various deletions, and in which embedded sentences were not introduced by cue words such as who or that. For example, two sentences can be simply conjoined by and: "The book hit the boy and the boy was crying." The first sentence can be embedded in the second in various ways; e.g.: "The boy who the book hit was crying." In addition, who can be deleted, giving: "The boy the book hit was crying." When Echo was 2;5;1 and 2;5;2 we administered systematically varied sets of sentences of these types. These structures were clearly beyond her competence, and were generally treated as word lists; e.g.:

(38) THE BOY THE BOOK HIT WAS CRYING
boy the book was crying (2;5;1)

Order was not necessarily preserved in these imitations; e.g.:

(39) THE HOUSE THE BOY HIT WAS BIG
boyhouse was big (2;5;2)

Occasionally reorderings looked as if Echo were searching for words with which to instantiate an SVO relation; e.g.:

(40) THE BOY THE CHAIR HIT WAS DIRTY
boy hit the chair was dirty (2;5;2)

Such extractions of SVO relations seemed to occur only when they were semantically plausible in Echo's speech. She would never say "boy hit house" or "boy hit marble"--perhaps because hit, for her, means "to strike with the palm of the hand." She would, however, extract "boy hit chair" and "boy hit man" from such sentences. It would seem that Echo's words bear both syntactic and semantic markers, and that she will form SVO constructions when she can identify not only two nouns and a verb, but a constellation of nouns and verb which can form a semantically acceptable relationship.

Echo frequently extracted SVO relations, in similar fashion, from scrambled sentences; e.g.:

(41) THE MAN THE BOY THE BOOK HIT TORE WHO
boythoman tore the book who (2;5;2)

There is, however, an important relation between sentence development and memory span which should not be overlooked here. Echo will perfectly imitate ungrammatical or anomalous sentences if they are short enough for her to hold an auditory image in short-term memory. For example, as young as 2;3;2 she repeated all possible orders of the three words "John loves company." The same, of course, is true of adult repetitions of deviant sentences. One must only call on mechanisms of assimilatory deformation when

the material--because of its length or complexity, or both--exceeds short-term memory capacity.

When sentences are short and simple enough, Echo makes amusing attempts to assimilate new words into her existing grammatical schemata, thus showing a fine sense of the role of context in providing clues for the lexical categorization of unknown items. One of the most amusing examples is her imitation of the following sentence, offered after one of the authors had read what he considered a singularly poor paper on transformational grammar and child language:

(42) CHOMSKY AND VERITAS ARE CRYING
Cynthia and Tasha...cry (2;5;3)

Cynthia and Tasha are friends of Echo. Clearly she has realized that the sentence calls for two proper nouns, and she has substituted two more familiar names which bear some phonological resemblance to those of the model sentence. This suggests that some phonological information is available in short-term memory. This is especially evident in apparent search for unfamiliar words, as in:

(43) EX POST FACTO I SEE THE QUARTER
eptah...quarter I see ekso...ekso, ekso, ekso, ekso (2;5;3)

Examples (42) and (43) do not agree with the finding of Smith, Shipley, and Gleitman that children "tend not to listen to adult speech beginning with unfamiliar words" (Smith, 1966, p. 3). Not only did Echo attend to unfamiliar words appearing in sentence-initial position, but she frequently repeated them without difficulty, as in:

(44) CUI BONO IS THE QUARTER
cui bona a quarter (2;5;3)

* * *

This is a very sketchy summary of what one can discover from carefully examining about 1000 elicited imitations in one child over a period of less than three months. We hope to have demonstrated that the method is a fruitful one. It must be used, we believe, together with running collections and analysis of spontaneous speech. This very preliminary analysis has convinced us that sentence recognition and imitation are filtered through the individual's productive linguistic system. More specifically, we believe that we can tentatively offer the following generalizations:

Echo can spontaneously utter sentences which she cannot imitate. On the other hand, she can give recoded imitations of model sentences which exceed her productive capacities.

Emphasis can lead her to repeat words she would normally omit from imitation, but she generally ignores repeated words in imitating model sentences.

If she comprehends a sentence, she need not repeat it in the order given. Reordering can also take place as a result of imposing SVO constructions upon model sentences.

The process of sentence recognition includes retrieval of both form and content. Syntactic structures take up space in memory, and frequently content will be sacrificed to the retention of form in immediate, rote imitation. On the other hand, if content has been retrieved and stored, it may be encoded in the child's own syntax in imitation.

A fine-grained analysis of repeated imitations of systematically varied model sentences can reveal aspects of the child's theory of syntax, including transformational rules and the syntactic and semantic markers borne by lexical items.

In short, a few months of work with one child have encouraged us to continue research of this sort. We believe that elicited imitation is a useful probe for revealing linguistic competence. In fact, we have just discovered that similar gain might come from studying imitation of model sentences by adults. In order to make the situation comparable to that of the child, the

the sentences must be long and complex, perhaps anomalous. We have an excellent set of such sentences available to us; they form the stimulus materials for a doctoral investigation currently being conducted at Berkeley by Robin Chapman. When adults--especially drowsy adults--are presented with Chapman's sentences for immediate imitation they frequently make the same sort of assimilatory deformations as Echo. They repeat words to make parallel constructions, they impose regular structures where they were absent, they drop out phrases, they hesitate, they substitute words, and so on. The following are a few intriguing examples of adult imitations of long, anomalous sentences:

(45) THE FLOCK OF BROAD-WINGED GEESE POURED THE ELECTRIC ANTELOPE INTO THE WATER
the flock of broad-winged geese poured the flock of antelope into the water

(46) THE ULTIMATE HEAT SNIFFED THE PATCH OF PACKED SNOW ON THE WINDOW-SILL
the ultimate heat packed the snow on the window-sill

(47) THE AZTECS OF TOTAL FREEDOM LINGERED TYRANNICAL SUPPRESSION TWO TIMES

Subject 1:
the...tyrannical Aztecs?...lingered two times..

Subject 2:
the Aztecs of tyrannical freedom lingered suppression two times

Subject 3:
the Aztecs of total freedom lingered total suppression two times

Adults even make changes on the basis of the sounds of words--a phenomenon frequently noted in children and in subjects under the influence of cortical depressants. For example, two subjects gave the following imitation of (48), in which "scattered a furry" became "scurried a furried":

(48) THE DUCK-BILLED COMMITTEE OF STUDENTS SCATTERED A FURRY ADVISOR ONCE A YEAR
the duck-billed committee of students scurried a furried advisor once a year

Adults often do not realize that they have changed a sentence in repetition--and sometimes they do. We imagine the same is true of Echo. We intend to pursue these suggestive parallels in more detail.

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